

REMARKS

Claims 16, 17, and 41 have been amended to correct minor typographical or grammatical errors, and not for reasons related to patentability. Claims 1-44 are pending in the present application. Favorable reconsideration of the pending claims is respectfully requested.

The specification has been amended to correct a minor typographical error and to include the patent number of the issued parent application.

Claims 1, 2, 8, 13-17, 19, 21-25, 27, 28, 34, 35, and 41 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,633,535 to Chao et al. (hereinafter “*Chao*”) in view of the article by Hunadi (hereinafter “*Hunadi*”) for the reasons set forth on pages 2-8 of the Office Action. Applicant respectfully traverses.

Claim 1 recites “a container disposed upon the substrate, wherein the grease is enclosed within the container and the substrate, and wherein the container is in contact with the active surface of the IC chip.” Independent claim 17 recites “a container disposed upon the substrate and enclosing a volume external to the IC chip elements, wherein the grease is enclosed within the container and the substrate, and wherein the grease fills the volume enclosed by the container.” Independent claim 41 recites “a container disposed upon the substrate, the container enclosing a volume external to the IC chip elements, wherein the grease is enclosed within the container and the substrate, and the grease fills the volume enclosed by the container.”

The Examiner asserts on page 3 of the Office Action that Figure 7 of *Chao* discloses “a container 40 disposed upon the substrate in contact with the active surface of the IC chip.” Applicant respectfully disagrees.

The specification of *Chao* describes the structures having reference numerals 40 in Figure 7 as “spacer pedestals 40” (col. 4, line 32). There is no teaching or suggestion that such spacer

pedestals can function as a “container” in which “grease is enclosed within the container and the substrate” as recited in each of claims 1, 17, and 41. Such spacer pedestals as disclosed in *Chao* are separate structures with openings therebetween and thus would not be able to function as a container for holding a grease material.

In addition, the Examiner asserts on page 3 of the Office Action that *Hunadi* discloses a chip package including “an IC chip mounted on a printed circuit board substrate having high thermal conductivity grease in contact with the active surface of the IC chip.” Applicant respectfully disagrees.

There is no specific teaching in *Hunadi* that the grease is placed in contact with the active surface of the IC chip as the Examiner asserts. Rather, *Hunadi* discloses that use of high thermal conductivity greases allows “the user to form a thin cross section of an interface material which is both low stress and removable. ... Additionally, greases can conform to surface irregularities and compensate for nonplanarity on the back side of the flip chip die, the top side of the CSP package or the back side of heat or fan sinks.” (Page 28, col. 2, emphasis added). Thus, *Hunadi* teaches that the grease is placed on the back side of a flip chip die, or the top side of a chip scale package, not on the active surface of the IC chip.

Hence, even if the teachings of *Chao* and *Hunadi* are combined, not all of the limitations of the presently claimed invention are met, since *Hunadi* teaches that the grease is placed on an inactive side of the IC chip and *Chao* does not disclose a container.

With respect to claims 9, 19, and 35, which recite a dam structure, *Chao* does not teach or suggest a container comprising a dam structure as the Examiner asserts. It is well understood that a “dam” is a barrier that checks the flow of a liquid (*see Webster’s Collegiate Dictionary*). As discussed above, the spacer pedestals of *Chao* are separate structures with openings

therebetween and thus would not be able to function as a container or a dam for holding a grease material.

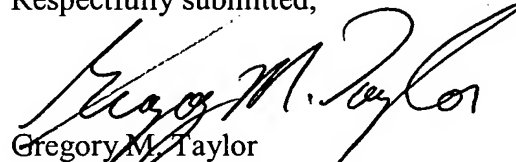
Accordingly, for the foregoing reasons, the presently rejected claims would not have been obvious over *Chao* in view of *Hunadi*. Thus, Applicant respectfully requests that the rejection of the claims under 35 U.S.C. § 103(a) be withdrawn.

CONCLUSION

In view of the foregoing, Applicant respectfully requests favorable reconsideration and allowance of the present claims. In the event there remains any impediment to allowance of the claims, which could be clarified in a telephone interview, the Examiner is respectfully requested to contact the undersigned attorney.

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Respectfully submitted,



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VERSION WITH MARKINGS TO SHOW THE CHANGES MADE

IN THE SPECIFICATION:

The paragraph beginning at page 2, line 2 has been amended as follows:

This application is a continuation of U.S. Patent Application Serial No. 09/387,640, filed on August 31, 1999, now U.S. Patent No. 6,424,033 B1, entitled Chip Package With Grease Heat Sink And Method Of Making. A divisional of the same parent application was filed on December 28, 2001, with Serial Number 10/033,233. Both applications are incorporated herein by reference in their entirety.

The paragraph beginning at page 9, line 15 has been amended as follows:

Figure 1 is an elevational cross-section view of an IC chip package 10 with a board-on-chip (BOC) configuration. Figure 1 illustrates an IC chip 12 disposed upon a substrate 14 such as a flexible PCB. The active surface 16 of IC chip 12 is disposed against a first side 50 of substrate 14. Emerging from the active surface 16 of IC chip 12, are bond wires 18 that act as electrical connectors between active surface 16 of IC chip 12 and substrate 14.

IN THE CLAIMS:

Claims 16, 17, and 41 have been amended as follows:

16. (Once Amended) An IC chip [packgae] package as defined in [Cliaim] Claim 1, wherein the grease has a weight loss at about 100°C after 30 days of less than about 0.15%.

17. (Once Amended) An integrated circuit (IC) chip package with IC chip elements having an IC chip with an active surface, the active surface having extending therefrom an electrical connector in electrical communication with the IC chip, the IC chip being mounted upon a substrate, the IC chip package comprising:

- a grease in contact with the active surface of the IC chip; and
- a container disposed upon the substrate and enclosing a volume external to the IC chip elements, wherein the grease is enclosed within the container and the substrate, and wherein the grease fills the volume enclosed by the container.

41. (Once Amended) An IC chip package with IC chip elements having an IC chip with an active surface, the active surface having an electrical connector extending therefrom in

electrical communication with the IC chip, the IC chip being mounted upon a substrate, the IC chip package comprising:

a grease in contact with the active surface of the IC chip, the grease having:

a thermal conductivity in a range from about 2 Watts/m·K to about 5 Watts/m·K;

a dielectric constant in a range from less than about 6 to about 9;

and

a melting point in a range from about 190°C to about 220°C; and

a container disposed upon the substrate, the container enclosing a volume external to the IC chip elements, wherein the grease is enclosed within the container and the substrate, and the grease fills the volume enclosed by the container.